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The primary aim of *World Journal of Gastrointestinal Surgery* (WJGS, *World J Gastrointest Surg*) is to provide scholars and readers from various fields of gastrointestinal surgery with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, etc.

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Mesh erosion into the colon following repair of parastomal hernia: A case report

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Abstract

BACKGROUND

In recent years, mesh has become a standard repair method for parastomal hernia surgery due to its low recurrence rate and low postoperative pain. However, using mesh to repair parastomal hernias also carries potential dangers. One of these dangers is mesh erosion, a rare but serious complication following hernia surgery, particularly parastomal hernia surgery, and has attracted the attention of surgeons in recent years.

CASE SUMMARY

Herein, we report the case of a 67-year-old woman with mesh erosion after parastomal hernia surgery. The patient, who underwent parastomal hernia repair surgery 3 years prior, presented to the surgery clinic with a complaint of chronic abdominal pain upon resuming defecation through the anus. Three months later, a portion of the mesh was excreted from the patient's anus and was removed by a doctor. Imaging revealed that the patient's colon had formed a t-branch tube structure, which was formed by the mesh erosion. The surgery reconstructed the structure of the colon and eliminated potential bowel perforation.

CONCLUSION

Surgeons should consider mesh erosion since it has an insidious development and is difficult to diagnose at the early stage.

Key Words: Mesh erosion; Mesh migration; Parastomal hernia; Intestinal fistula; Intestinal internal fistula; Case report

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Core Tip: In recent years, mesh has become a standard repair method for parastomal hernia surgery because it has the advantages of a low recurrence rate and low postoperative pain. However, using mesh to repair parastomal hernias also carries potential dangers. We report a case of a rare complication caused by mesh erosion 3 years after parastomal hernia repair using the keyhole method. Its atypical symptoms and imaging findings complicated the diagnosis. The aim of this case report was to raise awareness of this rare complication among surgeons.

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INTRODUCTION

Although the incidence of parastomal hernias remains unknown, it is predicted to be > 30% at 1 year, > 40% at 2 years, and \geq 50% after many years thereafter[1]. Suture repair is undoubtedly the simplest method for parastomal hernia repair, but its recurrence rate has been reported to be higher than that of mesh repair[2]. Hence, mesh repair remains the mainstream method for treating parastomal hernias. Mesh repair can reduce the recurrence rate but may cause potential mesh-related complications. Currently, there is a lack of comparative evidence between the different mesh types for parastomal hernia repair. However, synthetic uncoated mesh types are generally not considered for intraperitoneal use because of the risk of adhesion, intestinal erosion, and stenosis[1].

Here, we present the case of a patient who underwent parastomal hernia repair with intraperitoneal onlay mesh repair mesh and developed a rare complication 3 years after the procedure. We reviewed 137 cases in 132 case reports of mesh erosion from 1973 to 2022 by searching the keywords, “Mesh Erosion” and “Mesh migration” in PubMed.

CASE PRESENTATION

Chief complaints

In January 2021, a 67-year-old female who had undergone parastomal hernia repair surgery 3 years prior began experiencing chronic abdominal pain upon resuming defecation through the anus.

History of present illness

In January 2021, she underwent abdominal computed tomography (CT) for initial workup, which revealed a foreign material located in the distal colon (Figure 1A). Three months later, in April 2021, a portion of the foreign material was excreted from the patient’s anus. The patient consulted our center in an emergency and underwent CT examination again (Figure 1B). The foreign material was removed by a doctor who confirmed the foreign material as the mesh used in a parastomal hernia (Figure 1C and D).

History of past illness

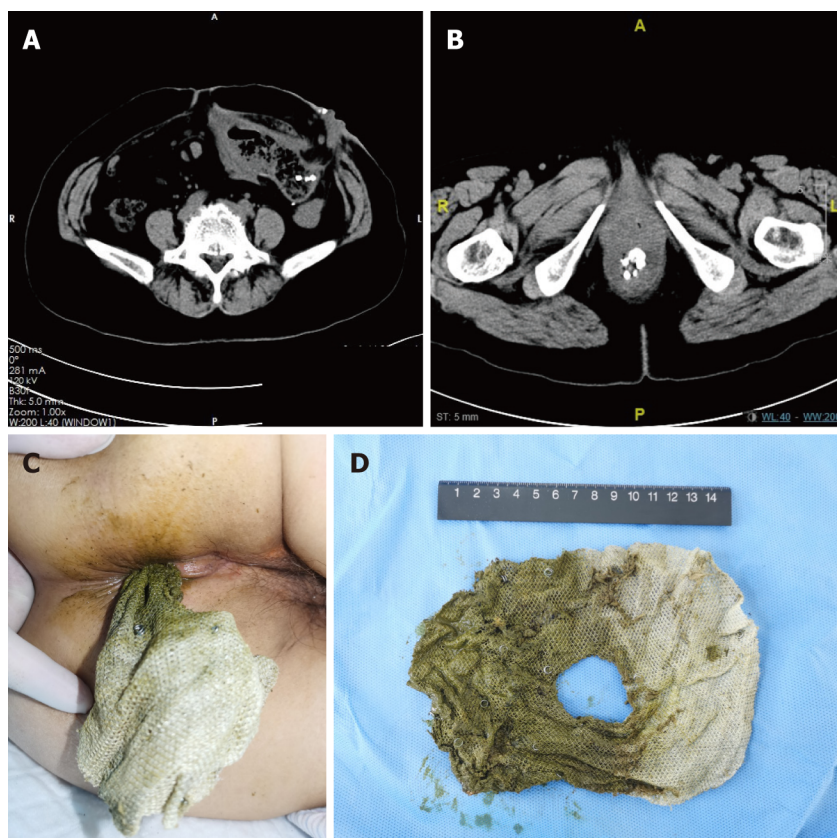
The patient underwent anus-preserving radical resection (Dixon operation) for rectal cancer in November 2010. The pathological diagnosis revealed rectal villous tubular adenocarcinoma with negative margins and no lymph node metastasis. Four months later, she was admitted to the hospital because of difficulty with defecation and was diagnosed with postoperative anastomotic stenosis. The stenosis was removed using a colonoscope. Recurrent defecation difficulties for 3 years led to an emergency colostomy for intestinal obstruction. According to the surgical records, the distal colon was removed and closed from the peritoneal reflection. In January 2018, the patient was admitted to our center and underwent parastomal hernia mesh repair (keyhole, Shanshi, China) for an emerging parastomal hernia.

Personal and family history

The patient underwent anus-preserving radical resection (Dixon operation) for rectal cancer in November 2010.

Physical examination

A portion of the foreign material was excreted from the patient’s anus. The foreign material was removed by a doctor who confirmed the foreign material as the mesh used in a parastomal hernia.



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Figure 1 The computed tomography images and the mesh. A: The computed tomography (CT) images were taken in January 2021; B: The CT images were taken before hospitalization in April 2021. In A and B metal tacks were seen entering the intestine with the mesh located near the anus; C: After hospitalization, the mesh was partially excreted through the anus; D: The mesh was excreted intact along with its metal tacks.

Laboratory examinations

Laboratory tests were unremarkable.

Imaging examinations

We performed gastrointestinal contrast, where a contrast agent was injected through the stoma revealing a t-branch tube structure in the enterocoelia (Figure 2). Transanal colonoscopy was performed and revealed stenosis blocking the passage of the colonoscope. Severe inflammation triggered by the mesh of the parastomal hernia was observed. Due to severe stenosis at the anastomosis, the t-branch tube structure could not be seen in this direction (Figure 3).

FINAL DIAGNOSIS

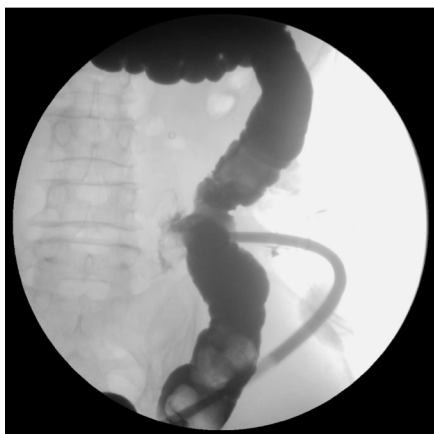
Mesh erosion into the colon secondary to bowel perforation.

TREATMENT

The patient was considered to have a potential intraperitoneal enteral leakage and consented to the elective operation. Midline abdominal incision was created, and the t-branch tube structure formed from the colon near the stoma, proximal and distal colons, and the lateral wall of the small intestine (Figure 4). The t-branch tube and unduly long colon was excised, and the original stoma was closed. A colostomy was reconstructed on the right side of the abdominal wall.

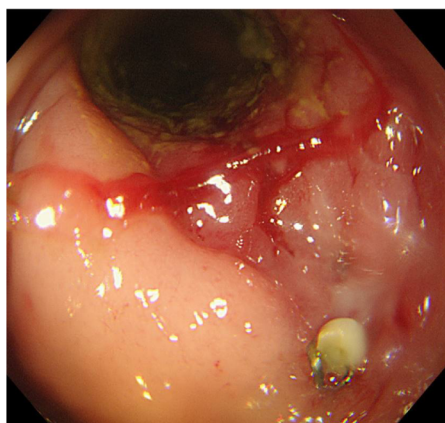
OUTCOME AND FOLLOW-UP

Pathological examination revealed granulomatous inflammation without tumor recurrence. The patient



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Figure 2 The contrast agent was injected through the drainage tube placed through the stoma. The intestinal tube formed a t-branch tube structure.



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Figure 3 Transanal colonoscopy revealed the stenosis. Metal tackers that have not yet been excreted can be seen.

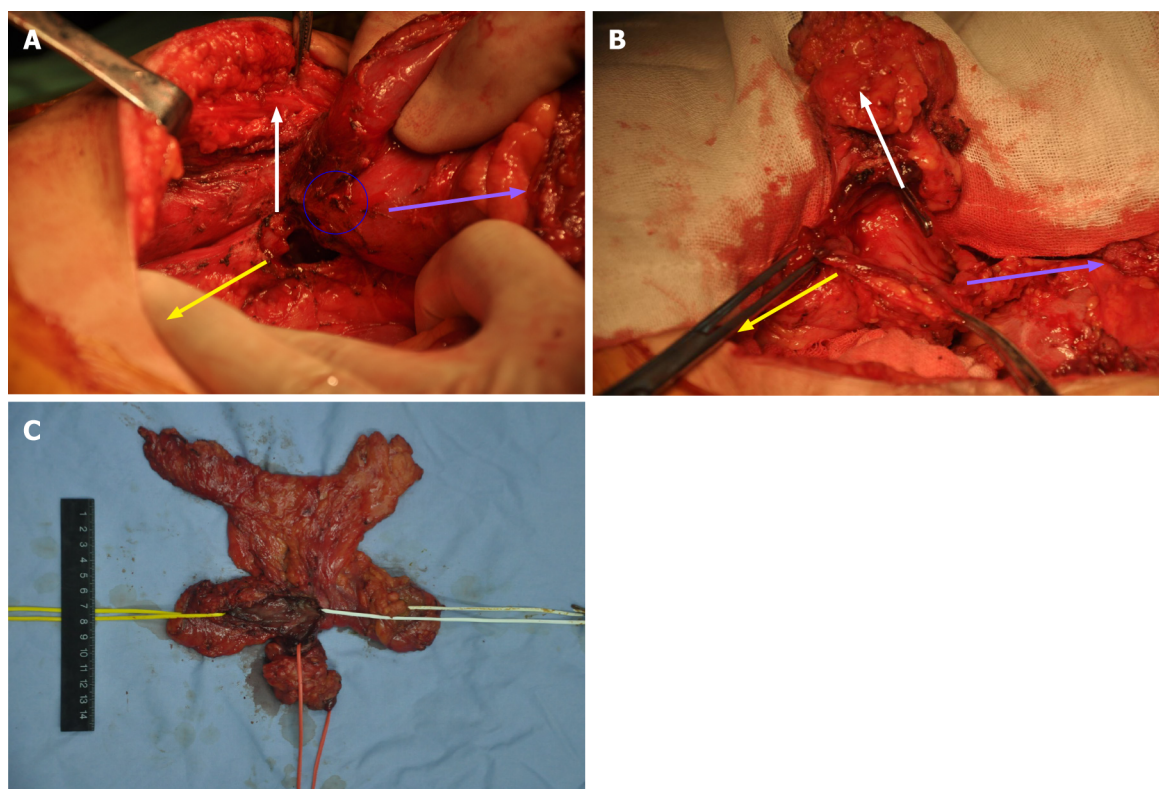
was discharged 10 d after the surgery. The patient showed no discomfort after discharge and continued receiving follow-up care on an outpatient basis.

DISCUSSION

According to the European Hernia Society guidelines on the prevention and treatment of parastomal hernias, the incidence of parastomal hernia is more than 30% 1 year after fistulization, more than 40% after 2 years, and can reach 50% or even higher over time[1]. In China, the number of patients undergoing abdominal surgery has increased, and the number of patients with parastomal hernias has gradually increased[2]. Due to the higher risk of recurrence after suture repair, mesh repair is still the best way to repair a parastomal hernia[1]. Common complications of a parastomal hernia repair include seroma, intestinal injury, intraoperative and postoperative bleeding, bowel perforation, hernia recurrence, intestinal obstruction, mesh contamination or infection, and chronic pain.

Mesh erosion is commonly considered a rare complication[3]. According to Jeans *et al*[4], the incidence of mesh erosion after inguinal hernia repair is less than 1%[4]. However, Hamouda *et al*[5] suggested that this percentage is significantly underestimated[5,6]. Targarona *et al*[7] reported that the incidence of graft erosion after hiatal hernia surgery was approximately 2.3%[7]. Unlike hiatal hernia, diaphragm movement is the primary cause of mesh migration and erosion[8]. Therefore, we hypothesized that the incidence of mesh erosion after parastomal hernia surgery would be lower than that after hiatal hernia surgery.

In our literature review, there was only one report of mesh erosion after parastomal hernia surgery [9]. There were only a few cases of parastomal hernia and a low incidence of mesh erosion occurring after various hernia surgeries. Particularly, mesh erosions after parastomal hernia surgeries are even more scarce. In addition, the initial symptoms are usually hematochezia, intestinal obstruction, or other



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Figure 4 The structure of the t-branch tube. A: The yellow arrow indicates the proximal colon, the white arrow indicates the colostomy colon, the purple arrow indicates the distal colon, and the blue circle indicates the small intestinal wall. Intraoperative exploration confirmed that the t-branch tube was composed of the distal colon, proximal colon, colostomy colon, and small intestinal wall; B: After separating the small intestinal wall, the structure of the t-branch tube could be more clearly identified; C: Surgical removal of the t-branch tube structure of the colon. The yellow marker shows the proximal colon, the green marker indicates the distal colon, the orange marker shows the original stoma, and the defect is the original small intestinal wall.

digestive system symptoms. Therefore, patients often seek treatment from gastroenterology or gastrointestinal surgery causing underreporting of mesh erosion. Moreover, the primary disease leading to a stoma can shorten the lifespan of patients, which may explain why parastomal hernias are uncommon.

We used “Mesh Erosion” and “Mesh migration” as the keywords to search in PubMed. The reference lists from the extracted studies were manually reviewed to identify additional potentially eligible studies. A total of 132 reports describing 137 cases of mesh erosion from 1973 to 2022 were reviewed (Table 1). All abdominal hernia types except hiatal hernia were included. Erosion caused by mesh placement due to pelvic floor prolapse and other diseases was excluded. The selected studies included 96 cases of mesh erosion of digestive organs, 42 cases of urinary system erosion (including 8 cases of both digestive system and urinary system erosion), and 7 cases of other systems (including 1 case of the inguinal region, 1 case of the testis, 3 cases of migration of only non-eroded organs, 1 case of a uterine adnexa, and 1 case of the heart).

Agrawal and Avill[10] believed that there are two main methods of mesh migration[10]. The first is the mesh migration along the path of least resistance caused by inadequate fixation or external forces. The second is the slow and gradual migration across the anatomical plane. The mesh may be displaced initially and then eroded into adjacent tissues, which is the erosion and migration of the mesh caused by a foreign body reaction[10]. Local tissue destruction from the inflammatory response, granulation tissue proliferation, and repetition of these two processes results in mesh erosion of the intestine. This process can take several years to occur.

Pathology and colonoscopy in the case reports of Millas *et al*[11], Celik *et al*[12], and Riaz *et al*[13] confirmed granulomatous inflammation at the lesion site, which proves the existence of this process and is consistent with the present case. According to Losanoff *et al*[14] and Hamouda *et al*[5], mesh erosion after inguinal hernia surgery is caused by direct contact between the rough mesh surface and organs such as the intestine. The parastomal hernia mesh includes a polyvinylidene difluoride and polyester layer and biological mesh. It is a basic requirement for a parastomal hernia mesh to contact the intestine; therefore, the effect of mesh material on intestinal erosion is irrelevant.

Riaz *et al*[13] suggested that trimming the sharpened edges of the mesh could prevent damage to the surface of the organs and prevent an inflammatory response that could lead to weakness and mesh erosion[13]. We agree with their opinion that an appropriate mesh should be selected to reduce the

Table 1 General information of the patients included in the review

Patient information		Number of cases
Sex	Male	110
	Female	27
Age	≤ 60 years old	57
	> 60 years old	80
Mesh erosion time	≤ 6 mo	22
	> 6 mo	114
Type of hernia	Inguinal hernia	83
	Incision hernia	33
	Umbilical hernia	10
	Parastomal hernia	1
	Obturator hernia	1
	Abdominal wall strengthening	5
	Abdominal wall hernia not specified	5
History of abdominal surgery other than hernia repair		56
Symptoms of prior mesh infection		17
Condition of hernia after mesh erosion	Hernia recurrence	17
	Incisional hernia	3
History of chemotherapy and immune-suppressive therapy		8

The time of invasion was not specified in 1 case. Incisional hernia occurred in 1 case after umbilical hernia repair, and invasion occurred after secondary hernia repair. Due to various emphases in the case reports, it was impossible to judge whether the items not mentioned were negative, so only positive results were counted.

necessary trimming. Particularly in cases of parastomal hernia, the central pore should be trimmed to minimize mechanical damage caused by friction between the mesh and intestine.

Goswami *et al*[15] reported a case of cecal erosion after transabdominal preperitoneal for a right inguinal hernia in a patient with a history of appendectomy before transabdominal preperitoneal[15]. Goswami *et al*[15] indicated that the adhesion caused by the patient's previous appendectomy predisposed the patient to further adhesion between the mesh and organ, which eventually promoted mesh erosion. Abdominal adhesions caused by previous surgeries cause the intestine to lose its ability to avoid injury. Moreover, repeated friction between the fixed intestine and the foreign body causes local tissue damage, leading to mesh erosion. Patients with parastomal hernias have had at least one or several previous operations. For a parastomal hernia, more attention should be paid to adhesions caused by previous operations on mesh erosion.

According to Yang[16], titanium tacks used to fix mesh are more likely to adhere to the intestine, which Hollinsky *et al*[17] confirmed through animal experiments. In our experience, titanium tacks also cause serious adhesions. Persistent inflammation may increase the risk of postoperative hernia mesh erosion and migration[11]. Parastomal hernias involve stomas; therefore, the surgical field is not as sterile as other hernia procedures, potentially leading to mesh erosion. Benedett *et al*[18] recommended that chemotherapy could lead to intestinal perforation and a difficult postoperative period[18]. Patients with parastomal hernia commonly have intestinal tumors, and the state of immunological prostration induced by chemotherapy should not be disregarded.

In our case, another cause that should not be overlooked is the potential iatrogenic causes. The surgeon who performed the stoma may have intended to perform secondary intestinal anastomosis; therefore, the distal colon of the closed loop was over reserved. Preoperative examination before the parastomal hernia repair did not reveal the status of a closed loop intestine. Irregular operation and incomplete preliminary examination before parastomal hernia repair are also important reasons for t-branch tube formation.

It is difficult to diagnose mesh erosion because of the level of damage needed for a patient to feel symptoms, which can vary and take many years to develop. In our review, we observed 96 bowel mesh erosion cases (Table 2). The symptoms of mesh erosion include chronic abdominal pain, vomiting, digestive tract hemorrhage, bowel perforation, and intestinal obstruction. In patients who may have one

Table 2 Diagnostic methods of mesh erosion of the intestinal tract in literature review

Examinations			Number of cases
First radiographic diagnosis	Positive	Mesh erosion	0
		Foreign body	1
	Negative	Other lesions	13
		No abnormal	3
First CT diagnosis	Positive	Mesh erosion	4
	Negative	Mesh migration	2
		Foreign body	4
		Other lesions	44
		No abnormal	6
First gastrointestinal angiography diagnosis	Positive	Mesh erosion	1
	Negative	Foreign body	0
		bowel perforation	12
		Other lesions	8
		No abnormal	1
First colonoscopy diagnosis	Positive	Mesh erosion	11
	Negative	Foreign body	3
		Other lesions	17
		No abnormal	6
Ultrasonic diagnosis	Positive	Mesh erosion	0
	Negative	Mesh migration	1
		Foreign body	1
		Other lesions	4
		No abnormal	2
MRI	Positive	Mesh erosion	0
	Negative	Foreign body	0
		Other lesions	2
		No abnormal	0

CT: Computed tomography; MRI: Magnetic resonance imaging.

or more of these symptoms, a negative fecal occult blood test may occur[12]. Determining mesh status using radiography is also difficult[19]. Among the 96 cases reviewed, the diagnosis was established during surgery in 74 cases, on the first endoscopy in 10 cases, on at least the second endoscopy in 7 cases, and by other means such as CT in 7 cases. A convenient and inexpensive objective assessment of mesh behavior after mesh placement is difficult because there are no routinely available mesh products with unique radiographic labels[20].

Our literature review concluded that radiography, CT, and gastrointestinal angiography could only diagnose intestinal obstruction and leakage, although identifying the actual cause was still difficult. Doppler ultrasound is only performed after clinical judgment of a doctor to determine the mesh location. In our case, because the metal tacks moved into the intestine with the mesh, the CT scan alone could diagnose mesh erosion in the intestine. Early colonoscopy can only detect inflammation, intestinal polyps, or diverticulum; therefore, it may be wrongly interpreted and misdiagnosed as a malignant tumor[21-23]. The actual cause can only be determined when patients undergo more than one colonoscopy or abdominal exploration after experiencing severe symptoms. The early diagnosis of mesh erosion is complex, and the history of hernia repair should not be ignored when a patient presents with abdominal symptoms.

In our literature review, only 9 patients did not receive surgical treatment, and the remaining patients with mesh erosions received surgical treatment. In the 9 cases opting for non-surgical treatment, some authors believed that surgery should still be performed[24-26]. Previous studies discussed that patients usually refuse surgical treatment at the onset of their symptoms but finally receive surgical treatment once they worsen[27,28]. Therefore, mesh erosion after parastomal hernia surgery should be actively treated. Due to the small number of cases, it was inconclusive if the mesh of a parastomal hernia erosion or the bowel loops should be removed and the stoma rebuilt. We believe that mesh erosion, especially penetration into the intestine, necessitates the removal of some or all of the mesh into the intestinal loops. The segment of the intestinal loop should be resected, and the stoma rebuilt. Owing to repeated operations at the original stoma, local skin scars cause difficulties in care of the stoma. Re-stoma reduces the possibility of postoperative intestinal leakage and improves the future nursing of patients.

CONCLUSION

Mesh erosion is a rare complication, but its real incidence may be higher than the reported incidence. Previous studies have speculated on the etiology, many of which are more prominent in patients with parastomal hernia after surgery. Mesh erosion has no typical clinical manifestations, imaging, and endoscopy characteristics. With its insidious behavior, mesh erosion is difficult to diagnose at an early stage. Surgeons should be aware of the surgical history of hernia repair especially when the patient with mesh presents with abdominal symptoms.

FOOTNOTES

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